3. Environmental Program Information

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LLNL is committed to enhancing its environmental stewardship and to reducing any impacts its operations may have on the environment. This chapter describes LLNL's Environmental Management System (EMS) and Pollution Prevention/Sustainability Program (P2S).

3.1 Environmental Management System

LLNL continues to enhance its EMS through systematic process improvements and increased focus on establishing specific environmental objectives and performance measures targets contained in Environmental Management Plans (EMPs). Progress toward goals is regularly measured and reported to senior management and other interested parties through a variety of means including periodic senior management reports and the yearly update of this Environmental Report. The Laboratory's EMS has successfully maintained its International Organization for Standardization (ISO) 14001 registration since 2009 and is audited annually by a third-party internationally recognized ISO registrar for continued conformance and certification.

3.1.1 Environmental Management Plans

EMPs are designed and implemented to address the Laboratory's most significant environmental aspects to achieve environmental objectives and performance measures (targets). EMPs are updated annually to incorporate new initiatives and effectively demonstrate LLNL's commitment to continuous improvement. **Table 3-1** lists the eight EMPs for FY 2012, along with the significant environmental aspects each addresses, the Lab-wide environmental objectives, and the related DOE sustainability goals. LLNL's status towards meeting each of the DOE sustainability goals listed in **Table 3-1**, along with planned actions to ensure continued progress towards attaining these goals can be found in the *LLNL FY13 Site Sustainability Plan* in **Appendix D**.

Table 3-1. Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Environmental Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goal(s)
Sustainable Acquisition	• Nonhazardous Materials Use • Municipal Waste Generation	Improve Sustainable Acquisition practices at LLNL through measureable progress on select commodity categories relevant to the organization's business and mission requirements, and recommend future improvements.	6.1: Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year).
Municipal Waste Reduction	• Municipal Waste Generation	Utilize energy efficient multi-functional business machines and increase the use of compostable or bio-degradable cafeteria products and energy efficient cafeteria equipment. Evaluate the results of the recycling pilot and make the necessary changes to enhance the Lab's recycling program.	5.1: Divert at least 50% of nonhazardous solid waste, excluding construction and demolition debris by FY15. 5.2: Divert at least 50% of construction and demolition materials and debris by FY15.
Greenhouse Gas Reduction	• Greenhouse Gas Emissions	Reduce LLNL greenhouse gas emissions through reductions in electrical energy, fossil fuels, and natural gas use, and management of SF6.	1.2: 13% Scope 3 GHG reduction by FY20 from a FY08 baseline. 3.2: 2% annual reduction in fleet petroleum consumption by FY20 relative to a FY05 baseline. 3.4: Reduce fleet inventory by 35% within the next 3 years relative to a FY05 baseline. 7.3: Electronic Stewardship - 100% of eligible PCs, laptops, and monitors with power management actively implemented and in use by FY12
Hazardous Materials Use and Hazardous Waste Generation	• Hazardous Materials Use Hazardous Waste Generation	Meet FY12 PEP 7.1.4 commitments for hazardous materials use and hazardous waste generation reductions.	n/a
Radioactive Materials Use	• Radioactive Materials Use	Meet FY12 PEP commitments for radioactive materials reductions.	n/a

Table 3-1. (cont.) Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Environmental Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goal(s)
Energy Conservation	• Electrical Energy Use • Greenhouse Gas Emissions • Fossil Fuel Consumption	Meet or exceed DOE O 430.2B and EO 13514 energy conservation goals.	2.5: 15% of existing buildings greater than 5,000 gross square feet (GSF) are compliant with the Guiding Principles (GPs) of HPSB by FY15. 2.6: All new construction, major renovations, and alterations of buildings greater than 5,000 GSF must comply with the GPs and where the work exceeds $5 million, each are LEED ® certified. 7.2: Maximum annual weighted average Power Utilization Effectiveness (PUE) of 1.4 by FY15. 7.3: Electronic Stewardship - 100% of eligible PCs, laptops, and monitors with power management actively implemented and in use by FY12.
Water Conservation	• Water Use	Meet or exceed FY12 PEP commitments, DOE O 430.2B and EO 13514 water conservation goals.	4.1: 26% water intensity reduction by FY20 from a FY07 baseline. 4.2: 20% water consumption reduction of industrial, landscaping, and agricultural (ILA) water by FY20 from a FY10 baseline.
Fossil Fuel Consumption	• Fossil Fuel Consumption	Meet or exceed EO 13514 requirements to reduce government vehicle fossil fuel consumption, replacement of light duty fleet with alternative fueled vehicles, and promote alternative fuels usage.	3.1: 10% annual increase in fleet alternative fuel consumption by FY15 relative to a FY05 baseline. 3.2: 2% annual reduction in fleet petroleum consumption by FY20 relative to a FY05 baseline. 3.3: 75% of light duty vehicle purchases must consist of alternative fuel vehicles (AFV) starting in FY00 and thereafter.

3.1.2 EMS Audits and Reviews

The Laboratory successfully completed two external third-party independent audits of its ISO 14001 EMS program (March 5–8 and August 4–10) with recommendations from the auditor to continue LLNL's ISO 14001 registration. These independent audits were conducted by NSF International Strategic Registrations and validated the Laboratory's solid commitment to environmental stewardship.

3.1.2.2 Internal Assessments and Reviews

In June 2012, a Senior Management Review of the EMS was conducted, reaffirming its commitment to the Lab's environmental policy and stewardship through the implementation of EMS.

In accordance with LLNL's EMS, the Laboratory's environmental compliance is regularly evaluated through reviews of internal assessments including Management Self Assessments (MSAs); Management Observations, Verifications and Inspections (MOVIs); regulatory inspections; internal and external monitoring and compliance reports; and facility walk-throughs and work-control assessments. As a result of these reviews, LLNL identifies specific practices and recommendations for corrective and preventive measures, demonstrating the Laboratory's commitment to environmental compliance.

3.2 Pollution Prevention/Sustainability Program

LLNL's P2S Program operates within the framework of the Integrated Safety Management System (ISMS) and EMS and in accordance with applicable laws, regulations, and DOE orders as required by contract. It encompasses stewardship and maintenance, waste stream analysis, reporting of waste generation and P2S accomplishments, and fostering of P2S awareness through presentations, articles, and events. The P2S Program supports institutional and directorate P2S activities via environmental teams and includes implementation and facilitation of source reduction and/or reclamation, recycling, and reuse programs for hazardous and nonhazardous waste; facilitation of sustainable acquisition; and preparation of P2S opportunity assessments.

The P2S Program at LLNL strives to systematically reduce all types of waste generated and eliminate or minimize pollutant releases to all environmental media from all aspects of the operations at the Livermore Site and Site 300. These efforts help protect public health and the environment by reducing or eliminating waste, improving resource usage, and reducing inventories and releases of hazardous chemicals. These efforts also benefit LLNL by reducing compliance costs and minimizing the potential for civil and criminal liabilities under environmental laws. In accordance with EPA guidelines and DOE policy, the P2S Program uses a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and lastly treatment and disposal), which is applied, where feasible, to all types of waste. Waste generation is tracked using RHWM's HazTrack database. By reviewing the information in this database, program managers and P2S Program staff can monitor and analyze waste streams to determine cost-effective improvements to LLNL operations.

3.2.1 Routine Hazardous, Transuranic, and Radioactive Waste

Routine waste listed in **Tables 3-2 and 3-3** includes waste from ongoing operations produced by any type of production, analysis, and research and development taking place at LLNL. The increase in routine hazardous waste in 2012 was due to an evaporator unit that was out of commission for part of the year and roofing debris from various projects. The increase in routine Low-Level Waste (LLW) volumes beginning in 2011 are due to NIF, PLS and WCI activities (largely wipe cleaning wastes and personal protective equipment (PPE) disposal), which are expected to continue in the future.

Table 3-2. Routine hazardous waste at LLNL, FY 2009–2012.

Waste category	FY 2009	FY 2010	FY 2011	FY 2012
Routine hazardous waste generated (MT)	159	116	143	232

Table 3-3. Routine transuranic and radioactive waste at LLNL, FY 2009–2012.

Waste category	FY 2009	FY 2010	FY 2011	FY 2012
Routine LLW generated (m^3)	203.5	211.2	678.3	861.7
Routine mixed waste generated (m^3)	24.6	21.0	27.4	45.9
Routine TRU/mixed TRU waste generated (m^3)	9.4	0.6	0.4	4.8

3.2.2 Diverted Waste

LLNL maintains an active waste-diversion program, encouraging recycling and reuse of both routine and non-routine waste. In 2010, DOE changed the annual reporting requirements for waste diversion in response to Executive Order 13514, issued October 5, 2009. This change required separate accounting for construction/demolition and municipal solid wastes and is reflected in **Tables 3-4 and 3-5**.

3.2.2.1 Municipal Solid Waste

Together, the Livermore Site and Site 300 generated 2,483 MT of routine nonhazardous solid waste in FY 2012. This volume includes diverted waste (e.g., material diverted through recycling and reuse programs) and landfill waste.

Both sites combined diverted a total 1,728 MT of routine nonhazardous waste in FY 2012, which represents a diversion rate of 70%. The portion of routine nonhazardous waste sent to landfill was 755 MT. See **Table 3-4**. In 2012, LLNL recycled 5,873 computers, monitors, and laptops, which were managed as universal waste. LLNL recycled 32 MT of large and small batteries, which were also managed as universal waste.

LLNL expanded recycling opportunities for plastics beyond the comingled recycling program by identifying a plastics recycling vendor to accept plastics from various program areas. In 2012, 1 MT of scrap plastics from the Plastics Shop and another 1.5 tons of plastic containers from NIF were recycled. The comingled recycling and composting program initiated in May 2011 was continued during 2012, diverting 67.5 MT of comingled recycling and 83 MT of compostable material from the landfill.

Table 3-4. Routine municipal waste in FY 2012, Livermore Site and Site 300 combined.

Destination	Waste description	Amount in FY 2012 (MT)
Diverted	Baled paper	72
	Corrugated cardboard	75
	Cooking grease (including grease traps)	35
	Mixed metals	674
	Scrap lead(Pb)	8
	Plastic (new in 2012)	2.5
	Office paper	169
	Scrap tires	8
	Toner cartridges	8
	Greenwaste (chips, compost, mulch)	327
	Wood	199
	Comingled recycling	67.5
	Compost (food scraps, paper towels, food containers)	83
	TOTAL diverted	**1,728**
Landfill	Compacted (landfill)	755
	TOTAL landfill	**755**
TOTAL routine nonhazardous waste		**2,483**

3.2.2.2 Construction and Demolition (C&D) Waste

C&D wastes include excavated soils, wastes and metals from construction, decontamination and demolition activities. The Livermore Site and Site 300 generated a total of 2,296 MT of waste related to construction and demolition activities in FY 2012. The two sites combined, diverted 1,317 MT of non-routine nonhazardous solid waste through reuse or recycling, which represents a diversion rate of 57% in FY 2012. Diverted C&D waste includes soil and concrete reused either on site for other projects or as cover at Class II landfills. See **Table 3-5**.

Table 3-5. Construction and Demolition waste in FY 2012, Livermore Site and Site 300 combined.

Destination	Waste description	Amount in FY 2012 (MT)
Diverted	Class II cover soil (reused at landfill)	422
	Class II concrete (reused at landfill)	888
	Scrap metals (recycled)	7
	TOTAL diverted	**1,317**
Landfill	Construction and demolition (non-compacted landfill)	979
	TOTAL landfill	**979**
	TOTAL non-routine non-hazardous waste	**2,296**

3.2.3 Sustainable Acquisition

LLNL has a comprehensive Sustainable Acquisition program that includes preferential purchasing of recycled content and biobased products. In 2012, the Sustainable Acquisition program continued to include a preference for Electronic Product Environmental Assessment Tool (EPEAT) registered products. Ninety-eight percent of all desktop electronics purchases in FY 2012 were EPEAT Silver or EPEAT Gold, indicating that the products meet or exceed the Institute of Electrical and Electronics Engineers (IEEE) 1680-2006 environmental performance standard for electronic products. Additional sustainable acquisition highlights can be found in the *LLNL FY13 Site Sustainability Plan* in **Appendix D**.

3.2.4 Pollution Prevention/Sustainability Activities

3.2.4.1 Environmental Stewardship Accomplishments and Awards

Each year, the P2S Program submits nominations for the NNSA environmental awards program, which recognizes exemplary performance in integrating environmental stewardship practices to reduce risk, protect natural resources, and enhance site operations. P2S also submits nominations for various other awards recognizing excellence in P2S projects. In 2012, LLNL received four NNSA Environmental Stewardship awards, and the DOE GreenBuy Program Gold award for sustainable acquisition.

"High Performance Computing Innovation Center: LLNL Program and Facility Development with the Environment in Mind" won an NNSA 2012 Best-In-Class Award in the Integrative Planning and Design category for developing the facility with a focus on environmental stewardship. The facility was constructed from refurbished trailers at a cost savings of $200,000 and a waste generation avoidance of 85 tons. The trailers were oriented to reduce heat buildup during long summer days and to share use of existing curb cuts and roadway. The facility also

includes the first permeable pavement used at LLNL and native vegetation to limit water consumption.

"Innovative Green Cleaning at LLNL National Ignition Facility" won an NNSA 2012 Environmental Stewardship Award in the Change Agents category for implementing an innovative green cleaning program. NIF is home to the world's largest laser. Spanning the width of three football fields, the facility houses 192 precision aligned laser beams in two bays under tight environmentally controlled conditions. Extreme cleanliness is required as any bit of debris, oil or other wayward material could cause the intense laser light to damage the optics. The custodial crew has made significant changes in both cleaning products and methods that have resulted in improved worker health and safety, as well as reduced environmental impacts from custodial operations.

"LLNL-SNL Hydrogen Shuttle Bus Collaborative Project" won an NNSA 2012 Environmental Stewardship Award in the Community Collaboration & Engagement category for demonstrating the use of hydrogen-powered vehicles at the LLNL and Sandia National Laboratories/California Laboratories (SNL/CA) and throughout the surrounding community. Two hydrogen buses were integrated into the LLNL taxi fleet used to transport employees at both the LLNL and SNL/CA. The buses were also extensively showcased throughout the local community to help raise public awareness of the benefits and safety of hydrogen technologies. The hydrogen buses reduced the use of traditional diesel-powered buses onsite, and were among the most heavily used in the DOE bus demonstration program, logging a combined 7,561 miles. At the point of use, this translated into a savings of approximately 8,000 kg carbon dioxide equivalent greenhouse gas emissions in comparison to diesel-powered buses.

"Fresh@thelabs – An LLNL-SNL/CA Farmers' Market Collaboration" won an NNSA 2012 Environmental Stewardship Award in the Community Collaboration & Engagement category for bringing the many benefits of a farmers market to our laboratory communities. In addition to providing a place for employees to purchase fresh locally grown produce and other goods, the market fostered a sense of community connection and engagement with a common meeting place, and promoted healthy behaviors with nutritious foods and physical activity opportunities. The LLNL-SNL/CA farmers market saw over 2,000 total attendees interacting with 20 Bay Area vendors to purchase items such as fresh and local fruits and vegetables, nuts and grains, flowers, and eco bags. Adding to the wholesome nutritious experience were gourmet lunch vendors, cooking demonstrations, and live music.

LLNL was the recipient of the 2012 Gold Award of the DOE GreenBuy Program for Sustainable Acquisition. To receive gold level recognition, LLNL demonstrated that the Green Buy Program leadership goals were met for nine products in five different categories including custodial, office and electronics, operations/fleet/shipping, construction, and cafeteria.

3.2.4.2 High-Performance Sustainable Buildings and Energy Conservation

The Facilities and Infrastructure Directorate manages the implementation of DOE Order 430.2B objectives related to sustainable building materials and practices. In FY 2008, a Green Cleaning

Policy was developed that meets the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) requirements. The goal of the Policy is to reduce the usage of potentially hazardous cleaning chemicals and their adverse impact on indoor air quality, occupant health, and the environment. LLNL continues to expand green cleaning lab-wide, with the goal to implement green cleaning at all applicable locations. Alternative solutions are evaluated as the industry improves and more green products that perform effectively become available. In FY 2012, the program identified additional products for floor care, making 98% of the products purchased for floor care Green Seal certified. The new floor care products have been used in 99% of facilities.

In FY 2012, four buildings were assessed using the High Performance Sustainable Building (HPSB) Assessment tool. These buildings (T1677, T1888, T1889, and T4675) were studied and benchmarked using both the EPA's Portfolio Manager Database and the HPSB Assessment Tool in six categories: integrated design, energy performance, water conservation, indoor air quality and reduction of environmental impact. In FY 2013, assessments for Buildings 1879, 5627, 1739, and 6925 will be completed, and eight additional buildings have been targeted for study in FY 2014.

3.2.5 Pollution Prevention/Sustainability Employee Training and Awareness Programs

In celebration of Earth Day 2012, P2S staff offered a week's worth of earth friendly events with the goal of engaging all LLNL staff. A variety of resources were used to create a cornucopia of offerings while minimizing costs. Employees with environmentally friendly and ecological interests presented Earth Day themed talks, speakers from the surrounding area volunteered their time to educate employees on sustainable yard and gardening tips, local auto dealers showcased alternative fuel vehicles including the Nissan Leaf and Chevy Volt, a local farm promoted community supported agriculture, and a Sierra Nevada wildlife conservation researcher discussed his work with the Pacific Fisher. Other activities included recycled art workshops for adults and kids and a low cost on-site document shredding for employee's personal documents. An environmental awards ceremony wrapped up the week. Neighboring SNL/CA Laboratories employees were invited to participate in the activities. During the weeks leading up to Earth Week employees were encouraged to 'give something back' by contributing to two important reuse drives. One requested old, clean tube socks to support Dr. Sweitzer's work with the rare Pacific Fisher (*Martes pennani*); the socks are used as bait holders to attract the Pacific Fisher into the open, where motion-activated cameras can capture them in action. The other drive put a call out to employees for their unwanted greeting cards and crayons that were used for recycled art workshops held during Earth Week. Many employees contributed to these drives and Earth Week events saw over 400 participants.

LLNL and SNL/CA Laboratories worked together to continue a monthly Farmers' Market held May through October. The P2S Program collaborated with the Farmers' Market project team to incorporate sustainability measures into the market events. P2S staff implemented a recycling and composting program for the market, distributed handout materials on the laboratory's

sustainability programs, and designed a recycling/composting game to continue employee education related to proper disposal of waste items.

The P2S Program conducted other awareness activities during the year. Articles on pollution prevention appeared in *NewsOnLine* (LLNL's internal online newsletter), and events were organized around America Recycles Day in November 2012. The P2S Program continues to conduct training for purchasing staff on Sustainable Acquisition requirements. The P2S Program developed a Green Event Planning guide to be used by laboratory organizations to assist them in reducing the environmental impact of events conducted at the Livermore Site and Site 300. Organizations implemented recommendations provided in the guide at 11 different events held in 2012.

The EFA Green Hotline provides support for employees with questions, suggestions, or ideas regarding LLNL's pollution prevention and waste diversion endeavors, as well as other environmental issues.